

WHAT IS CLAIMED IS:

- 1 1. A telecommunications network element, comprising:
 - 2 a first structure operable to effectuate signaling
 - 3 communication over a signaling network using a signaling protocol;
 - 4 a second structure operable to transport said signaling
 - 5 communication across a packet-switched network using an Internet
 - 6 Protocol (IP)-based transport protocol, said IP-based transport protocol
 - 7 including a plurality of IP-based messages; and
 - 8 a peer-to-peer protocol adaptation (PPA) structure
 - 9 associated with said first and second structures, said PPA structure
 - 10 operating to convert said signaling communication between said
 - 11 signaling protocol and said IP-based messages, said PPA structure
 - 12 including functionality to facilitate said first structure to locally process
 - 13 said signaling protocol's signaling messages.
- 1 2. The telecommunications network element as set forth in
- 2 claim 1, wherein said signaling protocol comprises an access signaling
- 3 protocol.

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1 3. The telecommunications network element as set forth in
2 claim 2, wherein said access signaling protocol comprises Q.931 protocol
3 associated with at least one of an Integrated Services Digital Network
4 (ISDN) and Primary Rate Interface (PRI) media.

1 4. The telecommunications network element as set forth in
2 claim 1, wherein said signaling protocol comprises a common channel
3 signaling protocol.

1 5. The telecommunications network element as set forth in
2 claim 4, wherein said common channel signaling protocol comprises
3 Signaling System No. 7 (SS7) protocol associated with switched circuit
4 network.

1 6. The telecommunications network element as set forth in
2 claim 5, wherein said switched circuit network comprises a wireline
3 telephony network.

1 7. The telecommunications network element as set forth in
2 claim 5, wherein switched circuit network comprises a wireless
3 telephony network.

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1 8. The telecommunications network element as set forth in
2 claim 5, wherein said IP-based transport protocol comprises Stream
3 Control Transmission Protocol (SCTP).

1 9. The telecommunications network element as set forth in
2 claim 8, wherein said PPA structure includes means to convert
3 transmission sequence numbers used by said SCTP protocol to message
4 sequence numbers used by said SS7 protocol.

1 10. The telecommunications network element as set forth in
2 claim 9, wherein said message sequence numbers used by said SS7
3 protocol include forward sequence numbers.

1 11. The telecommunications network element as set forth in
2 claim 9, wherein said message sequence numbers used by said SS7
3 protocol include backward sequence numbers.

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1 12. The telecommunications network element as set forth in
2 claim 8, wherein said PPA structure includes means for generating User
3 Data messages based on Message Signal Units provided by said SS7
4 protocol, said User Data messages being operable to be transported by
5 using said SCTP protocol.

1 13. The telecommunications network element as set forth in
2 claim 8, wherein said PPA structure includes means for generating Link
3 Status messages based on Link Status Signal Units provided by said SS7
4 protocol, said Link Status messages being operable to be transported by
5 using said SCTP protocol.

1 14. The telecommunications network element as set forth in
2 claim 8, wherein said PPA structure includes mapping means to maintain
3 a map between an SS7 communication link and its corresponding SCTP
4 association.

1 15. A telecommunications network, comprising:
2 a first network portion operable to transport signaling
3 messages using Signaling System No. 7 (SS7) protocol;
4 a second network portion based on Internet Protocol (IP),
5 said second network portion being operable to transport said signaling
6 messages using Stream Control Transmission Protocol (SCTP); and
7 a signaling gateway disposed between said first and second
8 network portions, said signaling gateway including a peer-to-peer
9 protocol adaptation (PPA) structure operable to interwork between said
10 SS7 protocol and SCTP messaging, wherein said PPA structure provides
11 a Level 2 Message Transfer Part (MTP2) interface between a Level 3
12 MTP (MTP3) layer of said SS7 protocol and said SCTP protocol, said
13 PPA structure including functionality to locally process functions
14 associated with an MTP2 layer.

1 16. The telecommunications network as set forth in claim 15,
2 wherein said signaling gateway is coupled to a signaling endpoint (SEP)
3 disposed in said first network portion.

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1 17. The telecommunications network as set forth in claim 15,
2 wherein said signaling gateway is coupled to a Signal Transfer Point
3 (STP) disposed in said first network portion.

1 18. The telecommunications network as set forth in claim 15,
2 wherein said signaling gateway is coupled to a Signal Switching Point
3 (SSP) disposed in said first signaling network.

1 19. The telecommunications network as set forth in claim 15,
2 wherein said signaling gateway is coupled to an IP-signaling point
3 (IPSP) disposed in said second network portion.

1 20. The telecommunications network as set forth in claim 19,
2 wherein said IPSP comprises an IP-based Service Control Point (IPSCP).

1 21. The telecommunications network as set forth in claim 19,
2 wherein said IPSP comprises an IP-based signaling endpoint (IPSEP).

1 22. The telecommunications network as set forth in claim 15,
2 wherein said signaling gateway is coupled to a media gateway controller
3 (MGC) disposed in said second network portion.

1 23. An Internet Protocol (IP)-based telecommunications
2 network for transporting Signaling System No. 7 (SS7) signaling
3 information to effectuate an Intelligent Network (IN)-capable service
4 architecture, comprising:

5 a first IP signaling point (IPSP) having a Level 3 Message
6 Transfer Part (MTP3) functionality associated therewith;

7 a second IP signaling point (IPSP) having a Level 3
8 Message Transfer Part (MTP3) functionality associated therewith;

9 an IP-based virtual link coupling said first and second
10 IPSPs, said IP-based virtual link being operable to propagate messages
11 using Stream Control Transmission Protocol (SCTP); and

12 each of said first and second IPSPs including a peer-to-peer
13 protocol adaptation (PPA) structure operable to interwork between
14 corresponding IPSP's MTP3 functionality and said SCTP protocol,
15 wherein said PPA structure provides a Level 2 Message Transfer Part
16 (MTP2) interface to said MTP3 functionality, said PPA structure
17 including functionality to locally process functions associated with said
18 MTP2 interface.

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1 24. The IP-based telecommunications network for transporting
2 SS7 signaling information as set forth in claim 23, wherein said first
3 IPSP comprises an IP signaling endpoint (IPSEP).

1 25. The IP-based telecommunications network for transporting
2 SS7 signaling information as set forth in claim 23, wherein said second
3 IPSP comprises an IP Service Control Point (IPSCP).

1 26. The IP-based telecommunications network for transporting
2 SS7 signaling information as set forth in claim 23, wherein said first
3 IPSP comprises a signaling gateway disposed in an SS7 signaling
4 network.

1 27. The IP-based telecommunications network for transporting
2 SS7 signaling information as set forth in claim 23, wherein said second
3 IPSP comprises an IP media gateway controller (MGWC).

1 29. The IP-based telecommunications network for transporting
2 SS7 signaling information as set forth in claim 23, wherein said second
3 IPSP comprises an IP Signal Transfer Point (IPSTP).

1 30. A method of transporting Signaling System No. 7 (SS7)
2 signaling information over an Internet Protocol (IP)-based network,
3 comprising the steps of:

4 establishing a virtual link across an IP connection between
5 two nodes, said virtual link being operable to propagate messages using
6 Stream Control Transmission Protocol (SCTP);

7 verifying said virtual link's integrity by one of said two
8 nodes;

9 interworking, at each of said two nodes, between a Level 3
10 Message Transfer Part (MTP3) functionality and said SCTP protocol by
11 a peer-to-peer protocol adaptation (PPA) structure provided thereat, said
12 PPA operating to convert SS7 signal bearer traffic into a stream of SCTP
13 messages; and

14 loading said virtual link with said stream of SCTP messages
15 for propagation between said two nodes over said virtual link.

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1 31. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 30, further comprising the steps
3 of:

4 determining if a predetermined quality condition associated
5 with said virtual link between said two nodes is degraded by a select
6 amount;

7 if so, suspending said stream of SCTP messages on said
8 virtual link and establishing an alternative link between said two nodes;
9 and

10 propagating said signal bearer traffic over said alternative
11 link.

1 32. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 31, wherein said alternative link
3 comprises an IP-based link.

1 33. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 31, wherein said alternative link
3 comprises an SS7 link.

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1 34. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 30, wherein one of said two
3 nodes comprises an IP Signal Transfer Point (IPSTP).

1 35. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 30, wherein one of said two
3 nodes comprises an IP signaling endpoint (IPSEP).

1 36. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 30, wherein one of said two
3 nodes comprises an IP Service Control Point (IPSCP).

1 37. The method of transporting SS7 signaling information over
2 an IP-based network as set forth in claim 30, wherein one of said two
3 nodes comprises an IP media gateway controller (MGWC).

1 38. A computer-accessible medium operable with a signaling
2 node, said computer-accessible medium carrying a sequence of
3 operations which, when executed by a processing entity associated with
4 said signaling node, causes said signaling node to perform the steps of:
5 establishing a virtual link across an IP connection associated
6 with said signaling node, said virtual link being operable to propagate
7 messages using Stream Control Transmission Protocol (SCTP);
8 verifying said virtual link's integrity by said signaling node;
9 interworking, at said signaling node, between a Level 3
10 Message Transfer Part (MTP3) functionality and said SCTP protocol by
11 a peer-to-peer protocol adaptation (PPA) structure provided thereat, said
12 PPA operating to convert SS7 signal bearer traffic into a stream of SCTP
13 messages; and
14 loading said virtual link with said stream of SCTP messages
15 for propagation over said virtual link associated with said signaling link.

1 39. The computer-accessible medium operable with a signaling
2 node as set forth in claim 38, further including instructions for
3 performing the steps of:

4 determining if a predetermined quality condition associated
5 with said virtual link is degraded by a select amount;

6 if so, suspending said stream of SCTP messages on said
7 virtual link and establishing an alternative link associated with said
8 signaling node; and

9 propagating said signal bearer traffic over said alternative
10 link.

1 40. The computer-accessible medium operable with a signaling
2 node as set forth in claim 39, wherein said alternative link comprises an
3 IP-based link.

1 41. The computer-accessible medium operable with a signaling
2 node as set forth in claim 39, wherein said alternative link comprises an
3 SS7 link.

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1 42. The computer-accessible medium operable with a signaling
2 node as set forth in claim 38, wherein said signaling node comprises an
3 IP Signal Transfer Point (IPSTP).

1 43. The computer-accessible medium operable with a signaling
2 node as set forth in claim 38, wherein said signaling node comprises an
3 IP signaling endpoint (IPSEP).

1 44. The computer-accessible medium operable with a signaling
2 node as set forth in claim 38, wherein said signaling node comprises an
3 IP Service Control Point (IPSCP).

1 45. The computer-accessible medium operable with a signaling
2 node as set forth in claim 38, wherein said signaling node comprises an
3 IP media gateway controller (MGWC).

1 46. A link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information,
3 said network including a local node and a remote node, wherein each of
4 said nodes includes an MTP3 structure, an M2PA structure, and an SCTP
5 structure, comprising the steps of:

6 establishing a link between said local and remote nodes by
7 creating an association therebetween;

8 detecting, by at least one of said local and remote nodes, that
9 a select condition related to said association has occurred;

10 responsive to said detection step, exchanging message
11 sequence number information between said local and remote nodes on an
12 alternative link established therebetween; and

13 based on said message sequence number information,
14 retransmitting messages over said alternative link, said messages starting
15 at a predetermined sequence number.

1 47. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 46, wherein said message sequence number
4 information comprises SCTP sequence number information.

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1 48. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 46, wherein said message sequence number
4 information comprises SS7 sequence number information.

1 49. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 48, wherein said SS7 sequence number information
4 comprises Forward Sequence Number information.

1 50. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 48, wherein said SS7 sequence number information
4 comprises Backward Sequence Number information.

1 51. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 48, wherein said select condition related to said
4 association comprises a Quality of Service (QoS) condition.

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1 52. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 48, wherein said select condition related to said
4 association comprises a link failure condition.

1 53. The link changeover method in an IP-based
2 telecommunications network for transporting SS7 signaling information
3 as set forth in claim 48, wherein said select condition related to said
4 association comprises a link reliability condition.